RAILER® SMS

Introduction to RAILER Sustainment Management System

Background

- Thousands of miles of military, short line, and industrial track worldwide.
- Strategic importance to defense and private economy.
- Requires proper maintenance and management to ensure requirements can be met.
- Lack of a standardized, objective system for reporting condition and readiness.
- Shrinking pool of experienced track personnel at many locations.

The RAILER® Technology

- Sustainment Management System (SMS) which includes PAVER, RAILER and ROOFER
- Assists facility managers in the sustainment, restoration and modernization (S&RM) of rail networks
- RAILER combines
  - Railroad engineering technology
  - Infrastructure management principles
  - Models, standards, and analysis procedures
  - Computer speed and power into a versatile decision support tool

RAILER® SMS

- Supports facility managers with the following information:
  - What rail assets exist.
  - What defects and deficiencies exist and costs to fix.
  - What restrictions are imposed – and the affect on operations and readiness.
  - What is the physical track health/condition (readiness ratings).
  - Short and long term maintenance strategies showing costs and affects of funding levels.
  - Assists both local installation and HQ level decision support through objective and consistent metrics

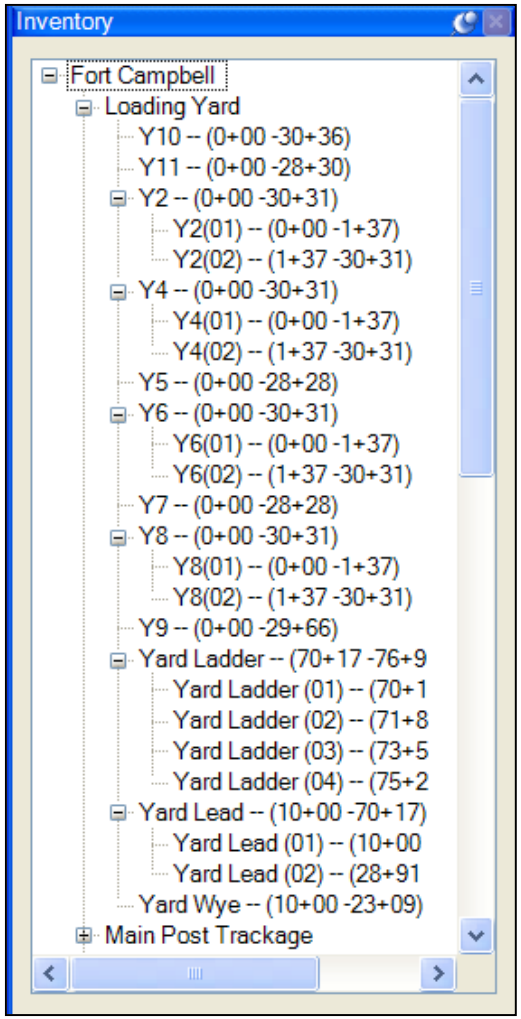
Implementation

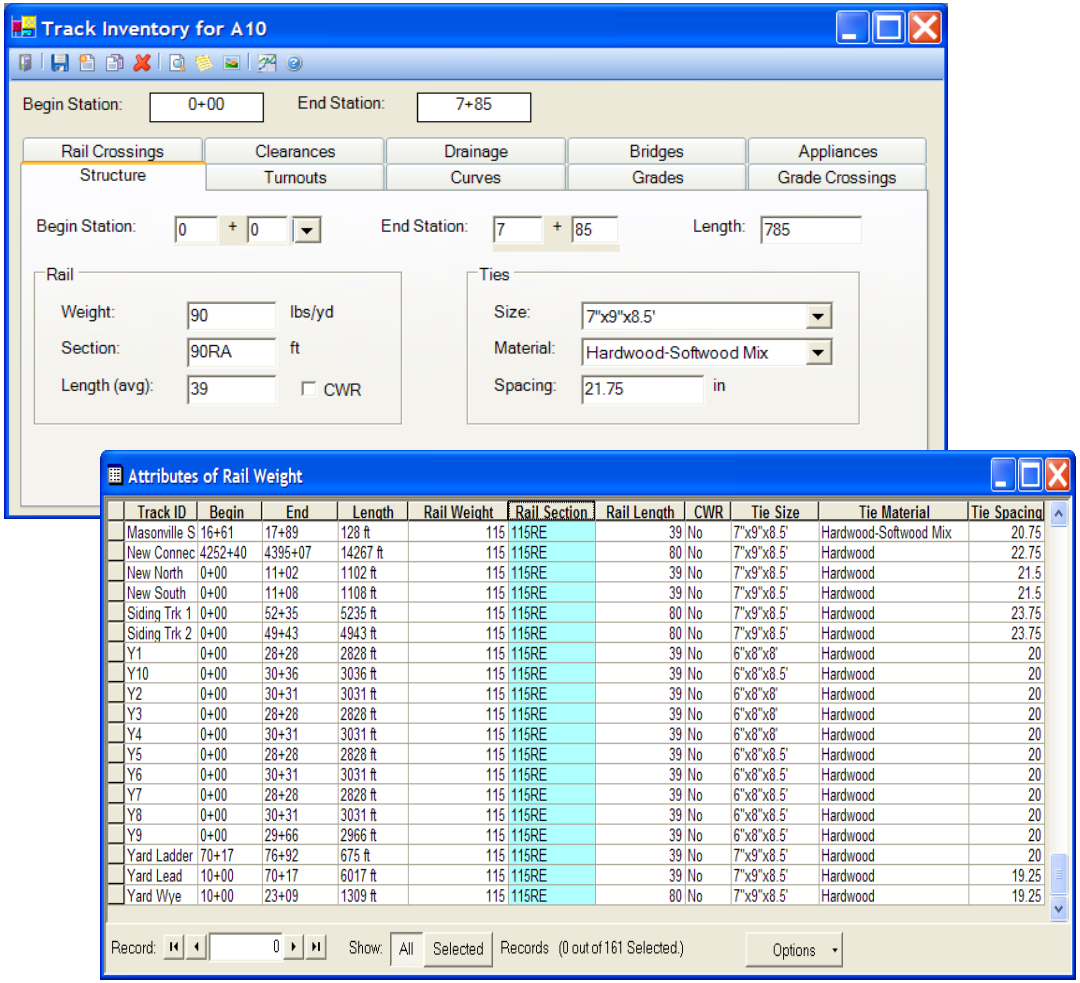
- Inventory collection
- Initial baseline detailed inspection
- Software and database setup
- Development of M&R policy and work plan creation
- Optional GIS linkages

Inventory

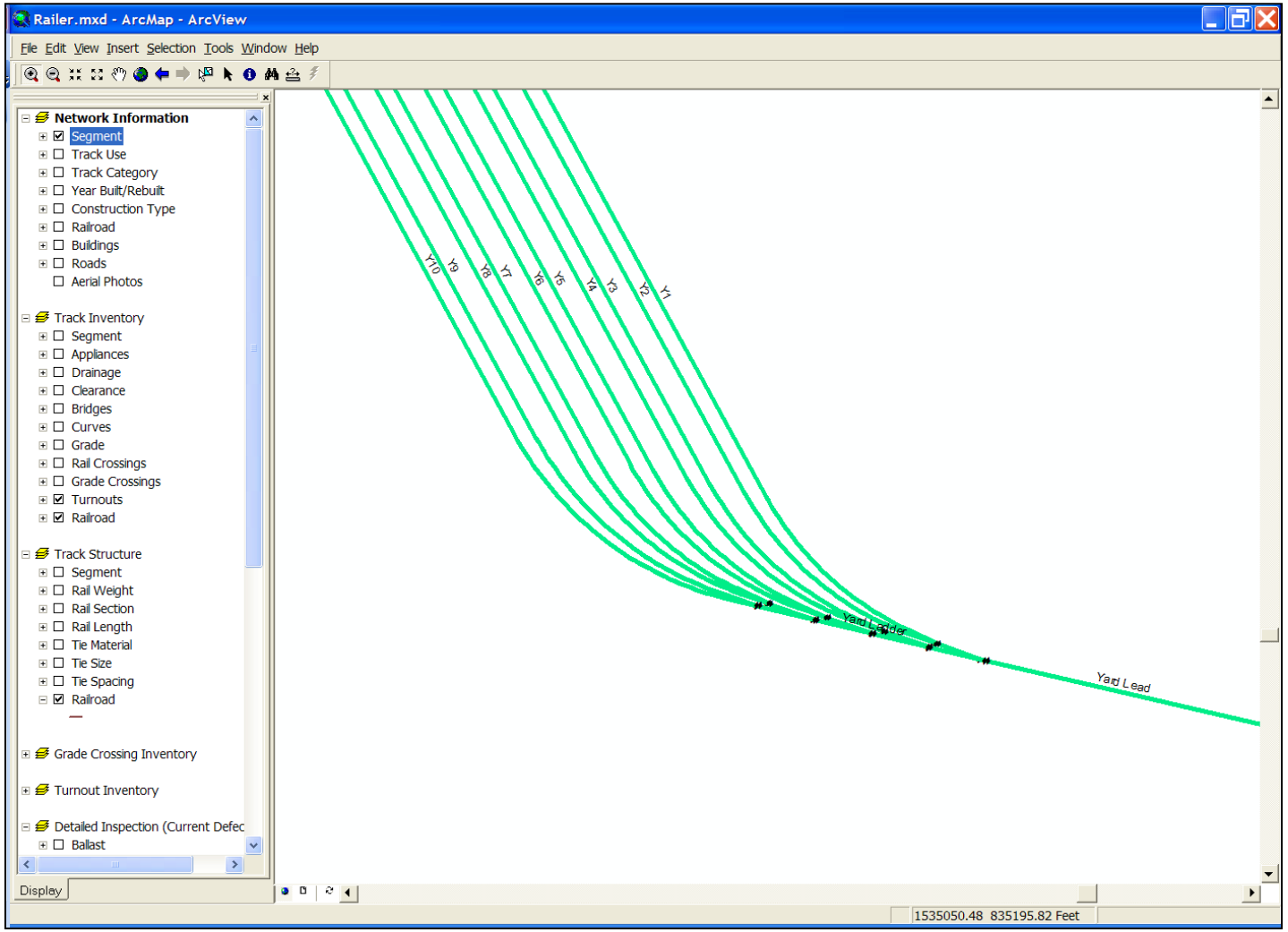
- Merge track information from a number of sources:
  - Track maps and drawings
  - Local institutional knowledge
  - Ad hoc databases, spreadsheets, etc.
- Organize track network in a hierarchical basis
- Establish a track stationing scheme
- Specify the attributes of the track structure, track geometry layout, and track components
- Store the location of track components and changes in track attributes.

Asset Inventory

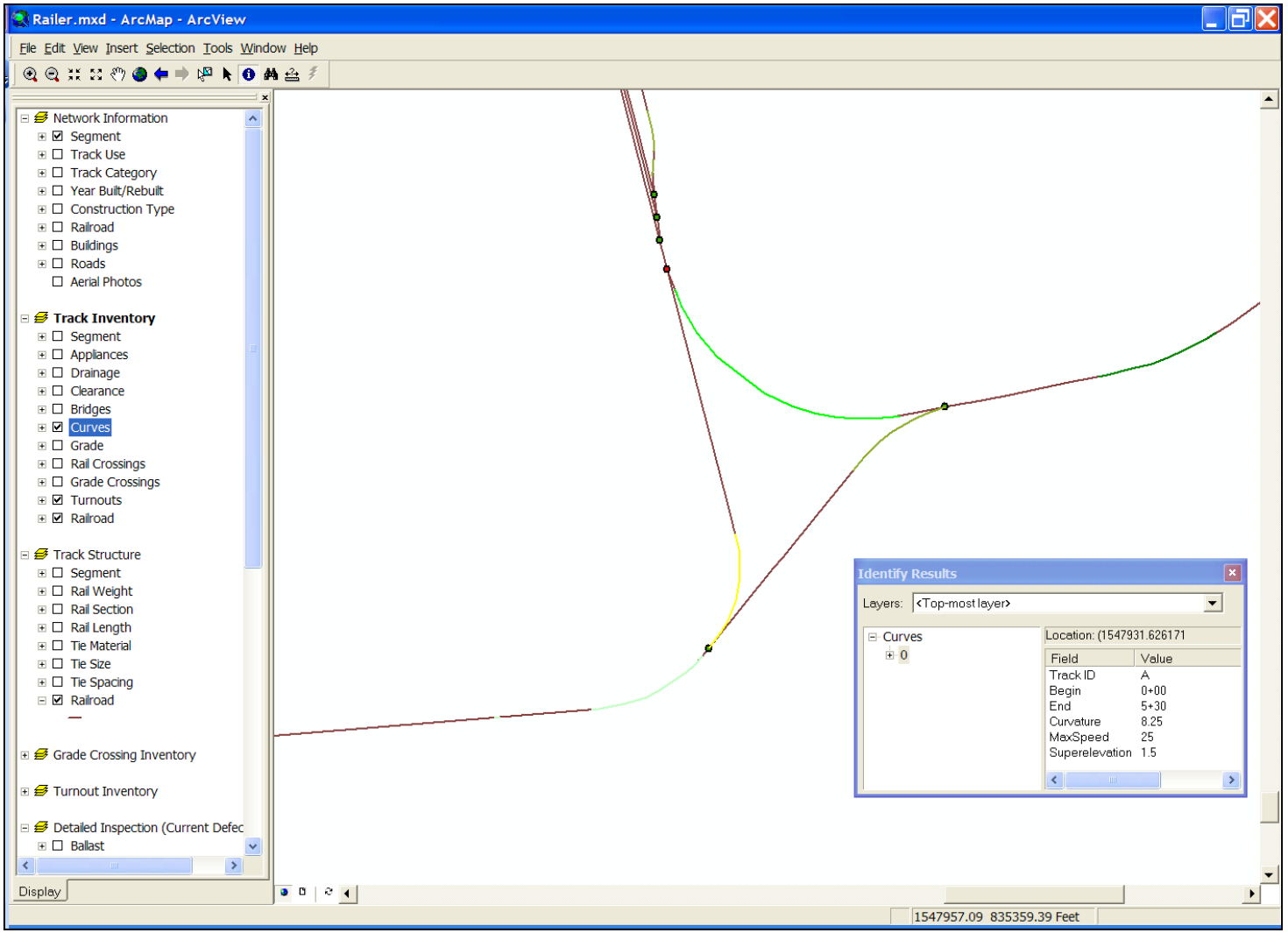



Track Inventory for A10
Begin Station: 0+00
End Station: 7+85
Rail Crossings
Clearances
Drainage
Bridges
Appliances
Structure
Turnouts
Curves
Grades
Grade Crossings
Begin Station: 0 + 0
End Station: 7 + 85
Length: 785
Rail
Weight: 90 lbs/yd
Section: 90RA ft
Length (avg): 39 CWR
Ties
Size: 7"x9"x8.5'
Material: Hardwood-Softwood Mix
Spacing: 21.75 in
Attributes of Rail Weight
Track ID | Begin | End | Length | Rail Weight | Rail Section | Rail Length | CWR | Tie Size | Tie Material | Tie Spacing
Masonville S | 16+61 | 17+89 | 128 ft | 115 | 115RE | 39 | No | 7"x9"x8.5' | Hardwood-Softwood Mix | 20.75
New Connec | 4252+40 | 4395+07 | 14267 ft | 115 | 115RE | 80 | No | 7"x9"x8.5' | Hardwood | 22.75
New North | 0+00 | 11+02 | 1102 ft | 115 | 115RE | 39 | No | 7"x9"x8.5' | Hardwood | 21.5
New South | 0+00 | 11+08 | 1108 ft | 115 | 115RE | 39 | No | 7"x9"x8.5' | Hardwood | 21.5
Siding Trk 1 | 0+00 | 52+35 | 5235 ft | 115 | 115RE | 80 | No | 7"x9"x8.5' | Hardwood | 23.75
Siding Trk 2 | 0+00 | 49+43 | 4943 ft | 115 | 115RE | 80 | No | 7"x9"x8.5' | Hardwood | 23.75
Y1 | 0+00 | 28+28 | 2828 ft | 115 | 115RE | 39 | No | 6"x8"x8' | Hardwood | 20
Y10 | 0+00 | 30+36 | 3036 ft | 115 | 115RE | 39 | No | 6"x8"x8.5' | Hardwood | 20
Y2 | 0+00 | 30+31 | 3031 ft | 115 | 115RE | 39 | No | 6"x8"x8' | Hardwood | 20
Y3 | 0+00 | 28+28 | 2828 ft | 115 | 115RE | 39 | No | 6"x8"x8' | Hardwood | 20
Y4 | 0+00 | 30+31 | 3031 ft | 115 | 115RE | 39 | No | 6"x8"x8' | Hardwood | 20
Y5 | 0+00 | 28+28 | 2828 ft | 115 | 115RE | 39 | No | 6"x8"x8.5' | Hardwood | 20
Y6 | 0+00 | 30+31 | 3031 ft | 115 | 115RE | 39 | No | 6"x8"x8.5' | Hardwood | 20
Y7 | 0+00 | 28+28 | 2828 ft | 115 | 115RE | 39 | No | 6"x8"x8.5' | Hardwood | 20
Y8 | 0+00 | 30+31 | 3031 ft | 115 | 115RE | 39 | No | 6"x8"x8.5' | Hardwood | 20
Y9 | 0+00 | 29+66 | 2966 ft | 115 | 115RE | 39 | No | 6"x8"x8.5' | Hardwood | 20
Yard Ladder | 70+17 | 76+92 | 675 ft | 115 | 115RE | 39 | No | 7"x9"x8.5' | Hardwood | 20
Yard Lead | 10+00 | 70+17 | 6017 ft | 115 | 115RE | 39 | No | 7"x9"x8.5' | Hardwood | 19.25
Yard Wye | 10+00 | 23+09 | 1309 ft | 115 | 115RE | 80 | No | 7"x9"x8.5' | Hardwood | 19.25
Record: 0
Show: All Selected
Records (0 out of 161 Selected)
Options

Track Layout



Track Attributes



Inspection Process

- Various Inspection Approaches:
  - Detailed “Control” Inspection
  - Safety Inspection
  - Operational Inspection
  - Results from rail flaw NDT inspection
- Inspection data can be quickly and easily recorded using “Remote Entry Database” (RAILER RED) program
- Identification of defects is consistent, repeatable, and easily retrievable.
- Inspection findings are dynamically stored in the RAILER database which facilitates usage. No more piles of paper forms.

RAILER® Defects

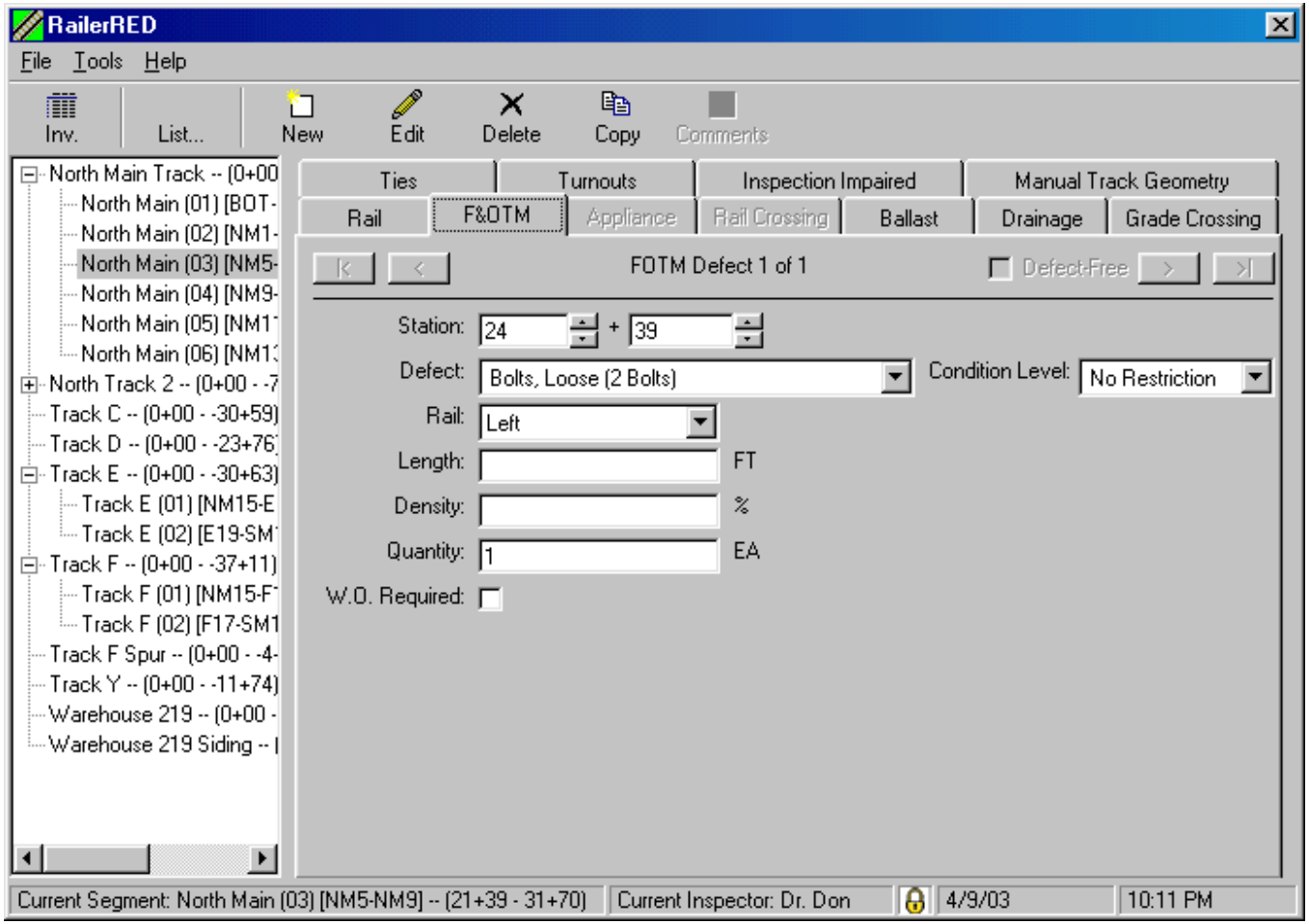
- Each defect is linked to:
  - Governing Operations or Restrictions standards
  - Condition Index Metric
  - Local Work Action to correct/repair

One inspection process feeds 3 separate requirements

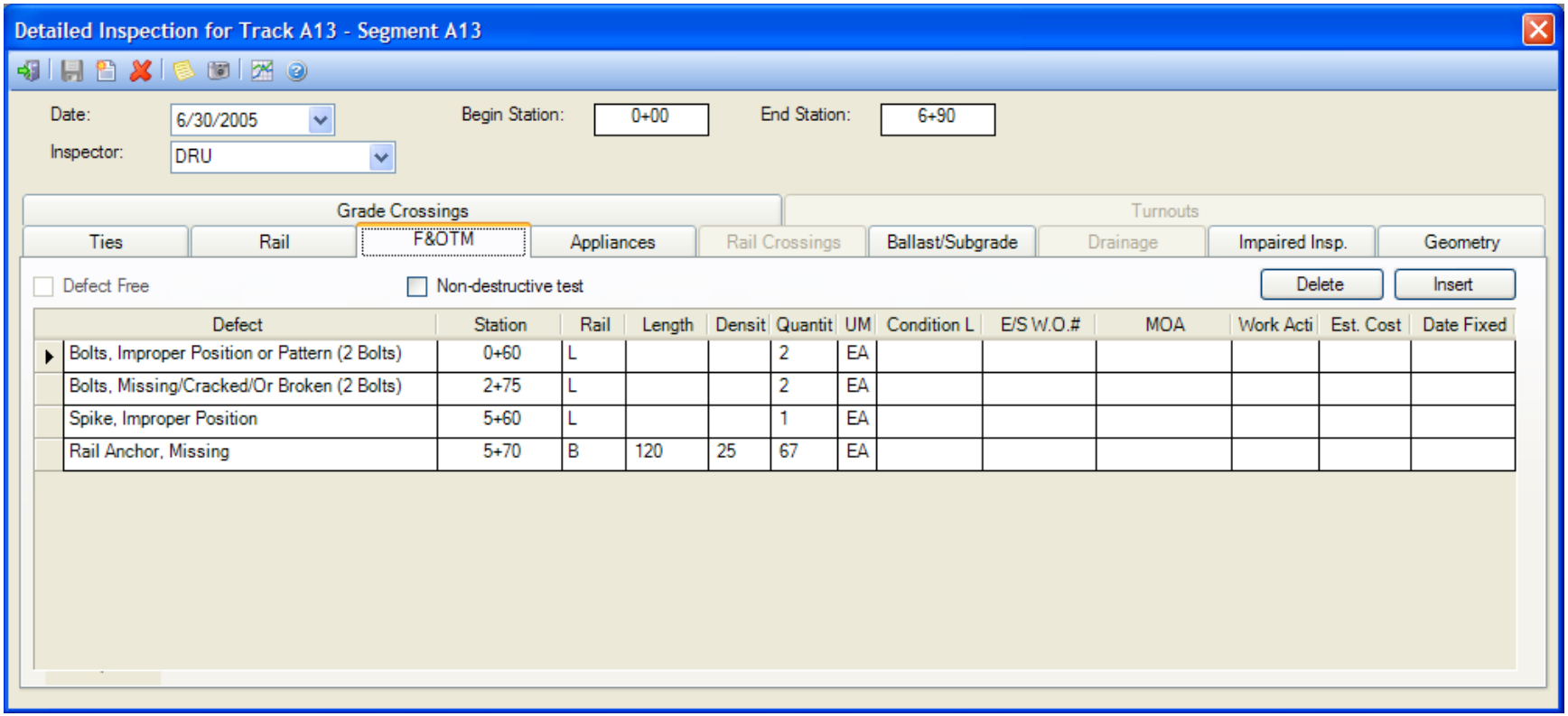
RAILER® RED

- RAILER Remote Entry Database (RED)
- Field data collection program for tablet PCs
- Displays defects from past inspections
- Inventory updates
- Data is electronically transferred to/from RAILER

RAILER® RED

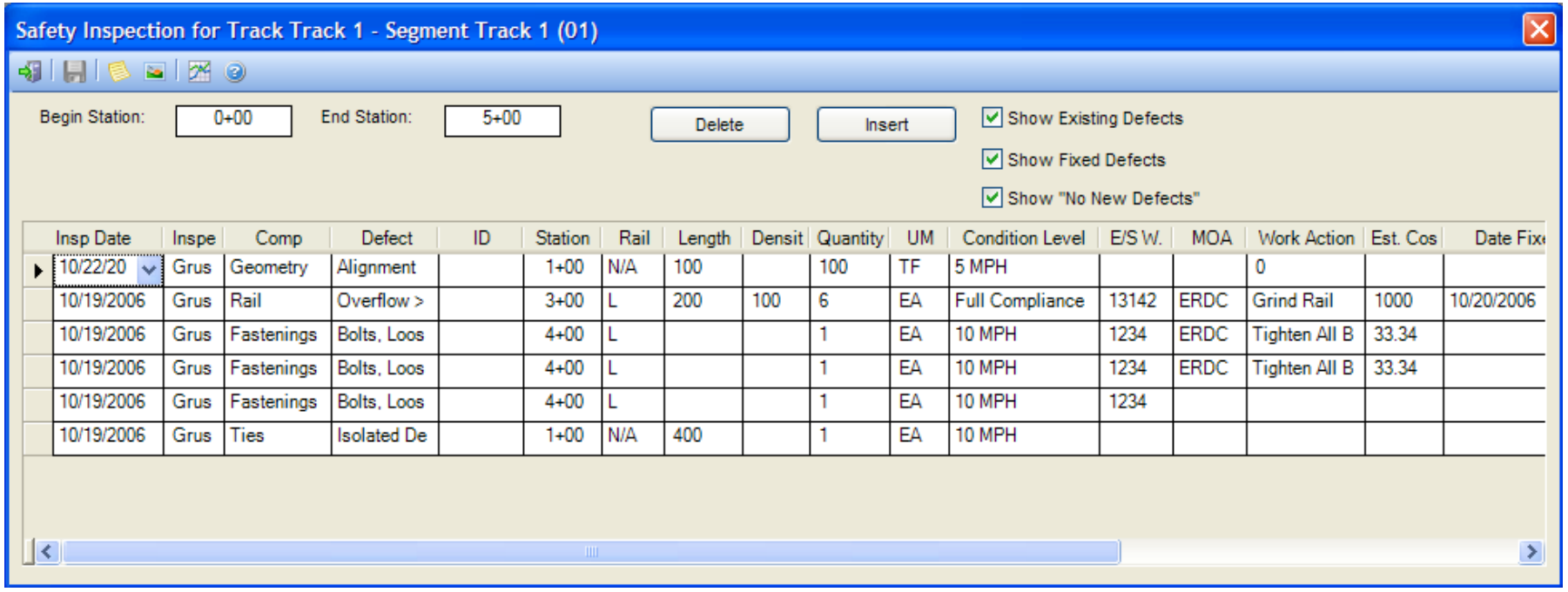

RailerRED
File Tools Help
Inv.
List...
New
Edit
Delete
Copy
Comments
North Main Track -- (0+00
North Main (01) [BOT-
North Main (02) [NM1-
North Main (03) [NM5-
North Main (04) [NM9-
North Main (05) [NM1
North Main (06) [NM1
North Track 2 -- (0+00 - -7
Track C -- (0+00 - -30+59)
Track D -- (0+00 - -23+76
Track E -- (0+00 - -30+63)
Track E (01) [NM15-E
Track E (02) [E19-SM
Track F -- (0+00 - -37+11)
Track F (01) [NM15-F
Track F (02) [F17-SM1
Track F Spur -- (0+00 - -4-
Track Y -- (0+00 - -11+74)
Warehouse 219 -- (0+00 -
Warehouse 219 Siding --
Ties
Turnouts
Inspection Impaired
Manual Track Geometry
Rail
F&OTM
Appliance
Rail Crossing
Ballast
Drainage
Grade Crossing
FOTM Defect 1 of 1
Defect-Free
Station: 24 + 39
Defect: Bolts, Loose (2 Bolts)
Condition Level: No Restriction
Rail: Left
Length:
FT
Density:
%
Quantity: 1
EA
W.O. Required:
Current Segment: North Main (03) [NM5-NM9] -- (21+39 - 31+70)
Current Inspector: Dr. Don
4/9/03
10:11 PM

Detailed Inspection Data



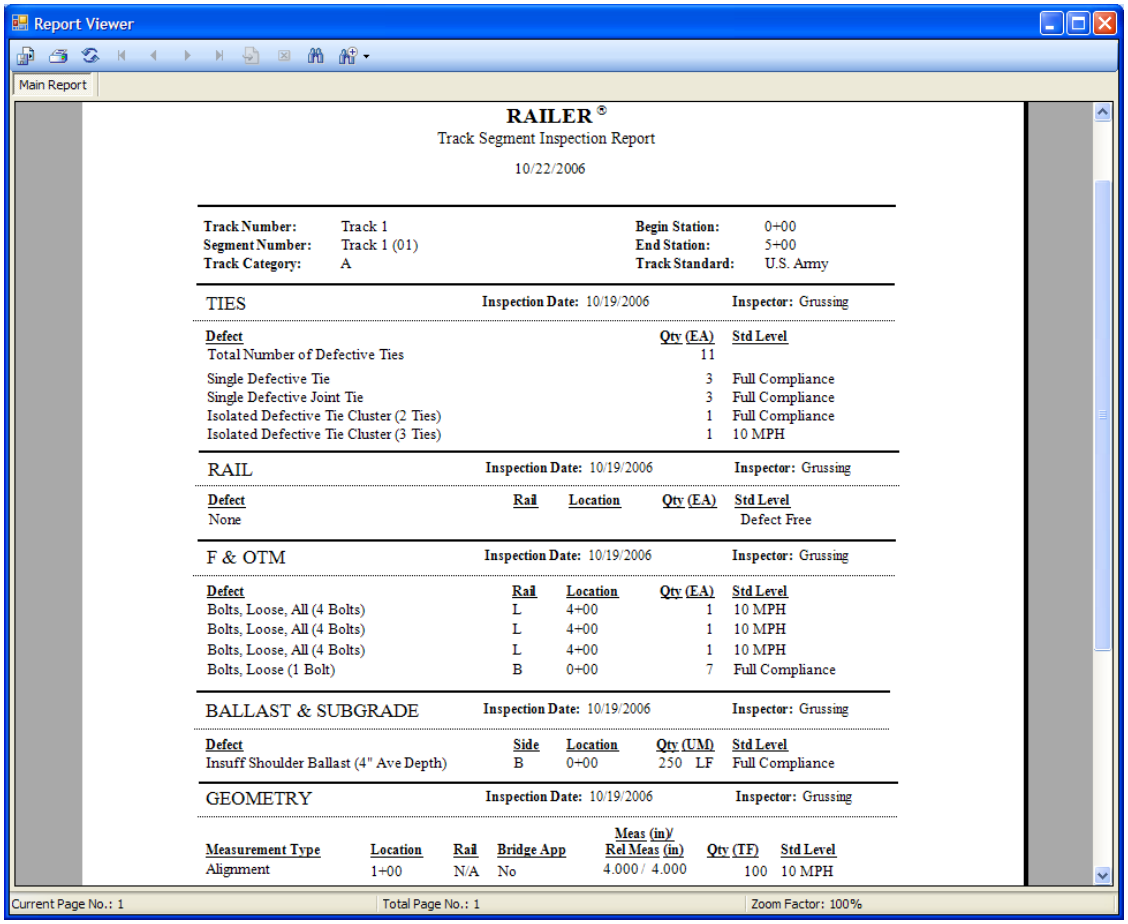
Defect	Station	Rail	Length	Densit	Quantit	UM	Condition L	E/S W.O.#	MOA	Work Acti	Est. Cost	Date Fixed
Bolts, Improper Position or Pattern (2 Bolts)	0+60	L			2	EA						
Bolts, Missing/Cracked/Or Broken (2 Bolts)	2+75	L			2	EA						
Spike, Improper Position	5+60	L			1	EA						
Rail Anchor, Missing	5+70	B	120	25	67	EA						

Safety Inspection Data



Insp Date	Inspe	Comp	Defect	ID	Station	Rail	Length	Densit	Quantity	UM	Condition Level	E/S W.	MOA	Work Action	Est. Cos	Date Fix
10/22/20	Grus	Geometry	Alignment		1+00	N/A	100		100	TF	5 MPH			0		
10/19/2006	Grus	Rail	Overflow >		3+00	L	200	100	6	EA	Full Compliance	13142	ERDC	Grind Rail	1000	10/20/2006
10/19/2006	Grus	Fastenings	Bolts, Loos		4+00	L			1	EA	10 MPH	1234	ERDC	Tighten All B	33.34	
10/19/2006	Grus	Fastenings	Bolts, Loos		4+00	L			1	EA	10 MPH	1234	ERDC	Tighten All B	33.34	
10/19/2006	Grus	Fastenings	Bolts, Loos		4+00	L			1	EA	10 MPH	1234				
10/19/2006	Grus	Ties	Isolated De		1+00	N/A	400		1	EA	10 MPH					

Inspection Reports


Report Viewer

Main Report

RAILER ®

Track Segment Inspection Report

10/22/2006

Track Number:	Track 1	**Begin Station:**	0+00
Segment Number:	Track 1 (01)	**End Station:**	5+00
Track Category:	A	**Track Standard:**	U.S. Army

TIES — **Inspection Date:** 10/19/2006 — **Inspector:** Grussing

Defect	Qty (EA)	Std Level
Total Number of Defective Ties	11	
Single Defective Tie	3	Full Compliance
Single Defective Joint Tie	3	Full Compliance
Isolated Defective Tie Cluster (2 Ties)	1	Full Compliance
Isolated Defective Tie Cluster (3 Ties)	1	10 MPH

RAIL — **Inspection Date:** 10/19/2006 — **Inspector:** Grussing

Defect	Rail	Location	Qty (EA)	Std Level
None				Defect Free

F & OTM — **Inspection Date:** 10/19/2006 — **Inspector:** Grussing

Defect	Rail	Location	Qty (EA)	Std Level
Bolts, Loose, All (4 Bolts)	L	4+00	1	10 MPH
Bolts, Loose, All (4 Bolts)	L	4+00	1	10 MPH
Bolts, Loose, All (4 Bolts)	L	4+00	1	10 MPH
Bolts, Loose (1 Bolt)	B	0+00	7	Full Compliance

BALLAST & SUBGRADE — **Inspection Date:** 10/19/2006 — **Inspector:** Grussing

Defect	Side	Location	Qty (UM)	Std Level
Insuff Shoulder Ballast (4" Ave Depth)	B	0+00	250 LF	Full Compliance

GEOMETRY — **Inspection Date:** 10/19/2006 — **Inspector:** Grussing

Measurement Type	Location	Rail	Bridge App	Meas (in)/ Rel Meas (in)	Qty (TF)	Std Level
Alignment	1+00	N/A	No	4.000 / 4.000	100	10 MPH

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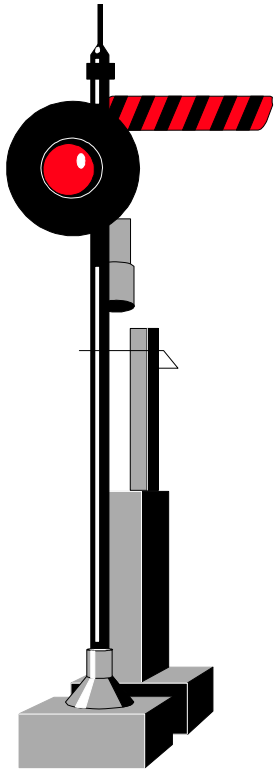
- Fixed Format "Hard Copy" Report of Inspection Results
- Can be generated to show current defects or any past inspection

Condition Assessment



- Based on information from the inspection process.
- Methods/Metrics used:
  - Track Standards
  - Condition Indexes
  - Army's Installation Status Report (ISR)

Track Standards

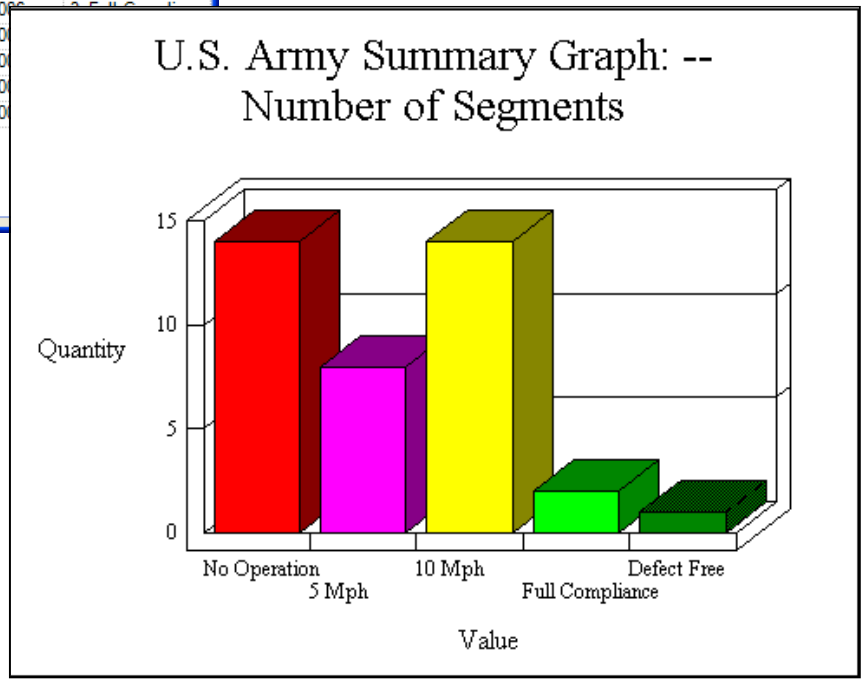
Spreadsheet Report Viewer

Summary | Details

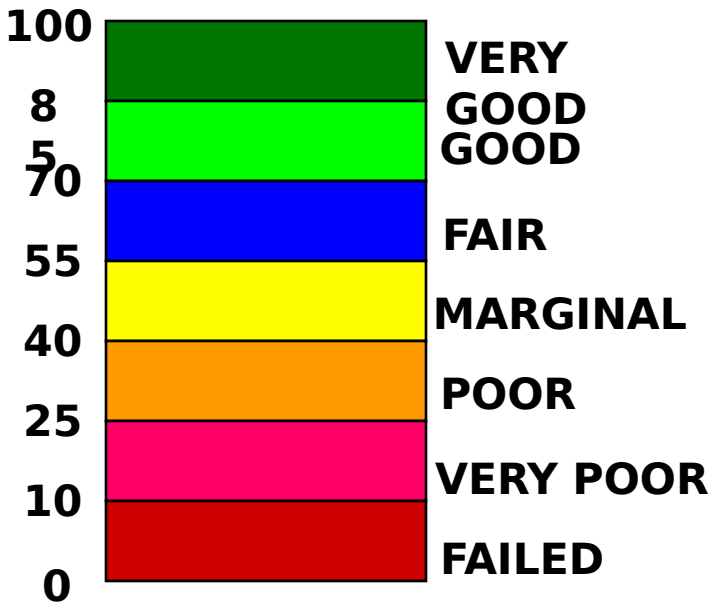
Standard Level Report

Drag a column header here to group by that column.

Track ID	Segment ID	Use	Category	Begin Station	End Station	Length	Last Insp	US Army
Track 1	Track 1 (01)	Access	A	0+00	5+00	500	10/22/2006	0: No Operation
Track 1	Track 1 (02)	Access	A	5+00	10+00	500	10/19/2006	0: No Operation
Track 1	Track 1 (03)	Access	A	10+00	15+00	500	10/19/2006	2: 10 MPH
Track 1	Track 1 (04)	Access	A	15+00	20+00	500	10/19/2006	1: 5 MPH
Track 2	Track 2 (01)	Access	A	0+00	5+00	500	10/22/20	
Track 2	Track 2 (02)	Access	A	5+00	10+00	500	10/22/20	
Track 2	Track 2 (03)	Access	A	10+00	15+00	500	10/22/20	
Track 3	Track 3 (01)	Access	A	0+00	5+00	500	10/22/20	
Track 3	Track 3 (02)	Access	A	5+00	10+00	500	10/20/20	



Condition Indexes (CI)



- Compute condition index for tie, rail, and ballast components for each segment.
- Compute an overall index (TSCI) for the track structure for each segment.
- Roll-up TSCI for tracks, areas and network.

Condition Indexes (CI)

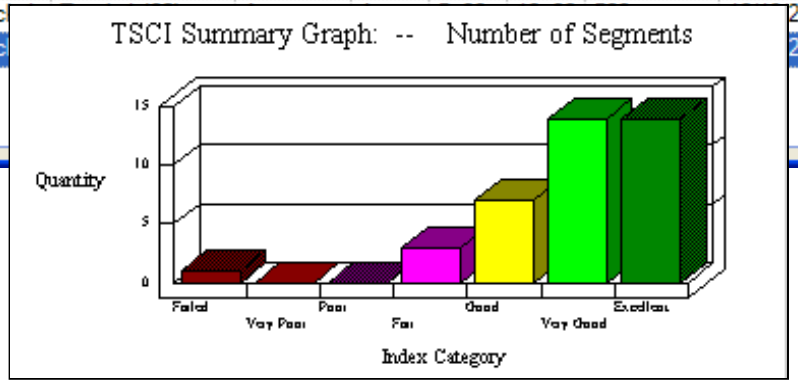
Spreadsheet Report Viewer

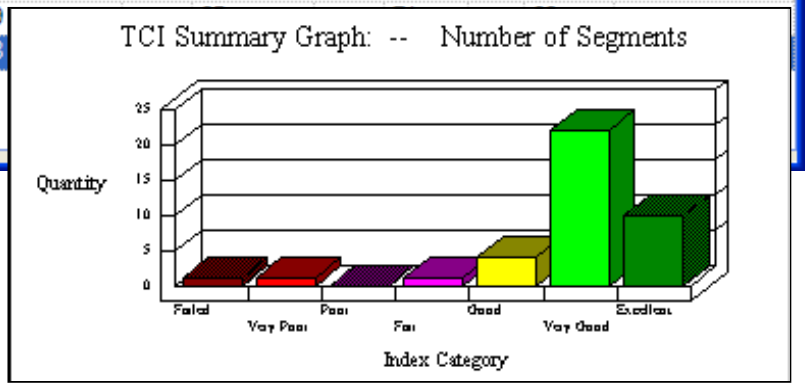
Summary | Details

Condition Index Report

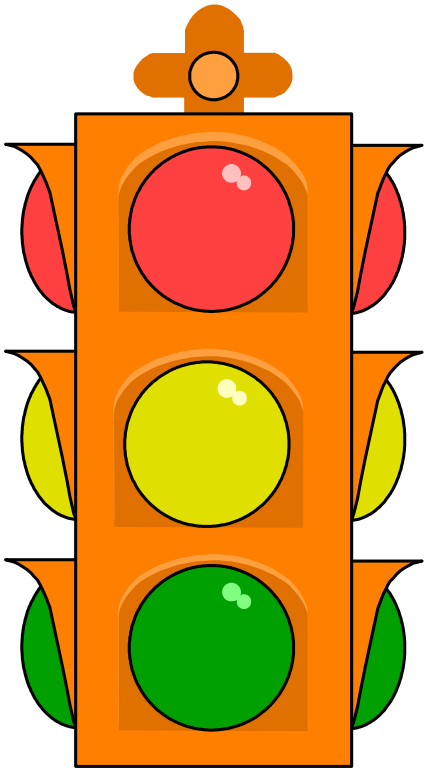
Drag a column header here to group by that column.

Track	Segment ID	Use	Cate	Begin	End	Length	Last Insp	TSCI	TS	TCI	TCI	RJC	RJ	BSC	BSCI Det Rat
Track 3	Track 3 (01)	Access	A	0+00	5+00	500	10/22/2006			99				71	
Track 3	Track 3 (02)	Access	A	5+00	10+00	500	10/20/2006			98				84	
Track 2	Track 2 (01)	Access	A	0+00	5+00	500	10/22/2006			99					
Track 2	Track 2 (02)	Access	A	5+00	10+00	500	10/22/2006			99					
Track 2	Track 2 (03)	Access	A	10+00	15+00	500	10/22/2006			99					
Track 1	Track 1 (01)	Access	A	0+00	5+00	500	10/19/2006	61		90		68		48	
Track 1	Track 1 (03)	Access	A	10+00	15+00	500	10/19/2006	67		77		88		53	
Trac							2006	79							
Trac							2006	88							





Installation Status Report (ISR)



- Condition levels:
  - Red
  - Amber
  - Green
- Based on TSCI.
- Compute for each track segment as well as the total network.

Installation Status Report (ISR)

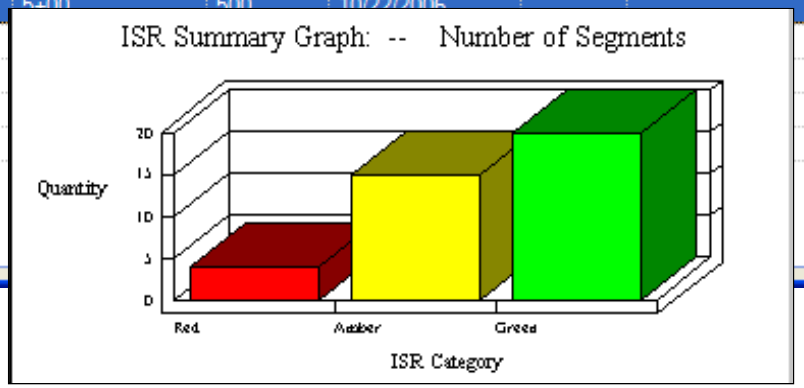
Spreadsheet Report Viewer

Summary | Details

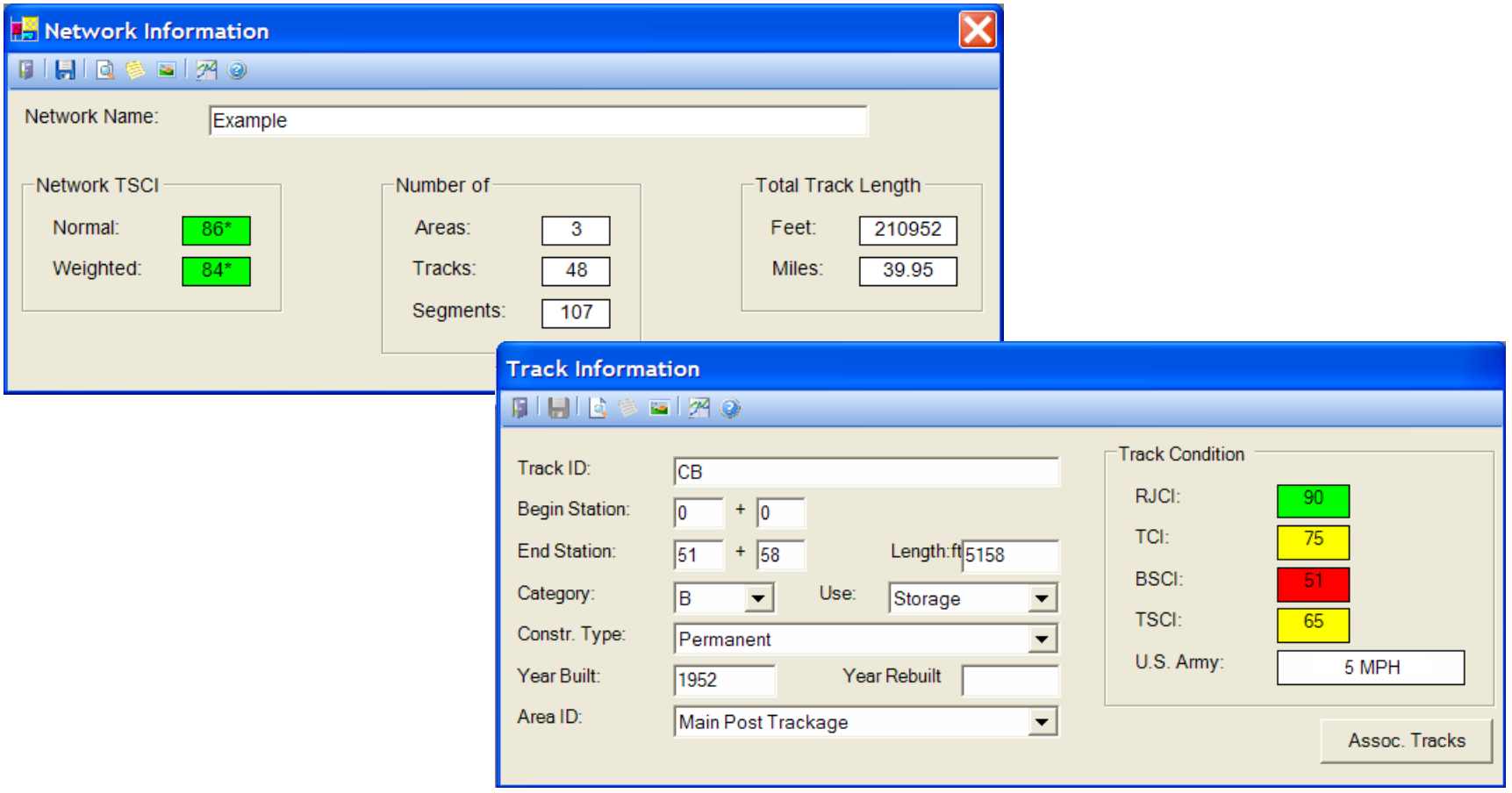
ISR Report

Drag a column header here to group by that column.

Track ID	Segment ID	Use	Category	Begin Station	End Station	Length	Last Insp	T S C I	I S R
Track 1	Track 1 (04)	Access	A	15+00	20+00	500	10/19/2006	88	Green
Track 1	Track 1 (01)	Access	A	0+00	5+00	500	10/19/2006	61	Amber
Track 1	Track 1 (03)	Access	A	10+00	15+00	500	10/19/2006	67	Amber
Track 1	Track 1 (02)	Access	A	5+00	10+00	500	10/19/2006	79	Amber
Track 2	Track 2 (01)	Access	A	0+00	5+00	500	10/22/2006		
Track 2	Track 2 (02)	Access	A	5+00					
Track 2	Track 2 (03)	Access	A	10+00					
Track 3	Track 3 (01)	Access	A	0+00					
Track 3	Track 3 (02)	Access	A	5+00					



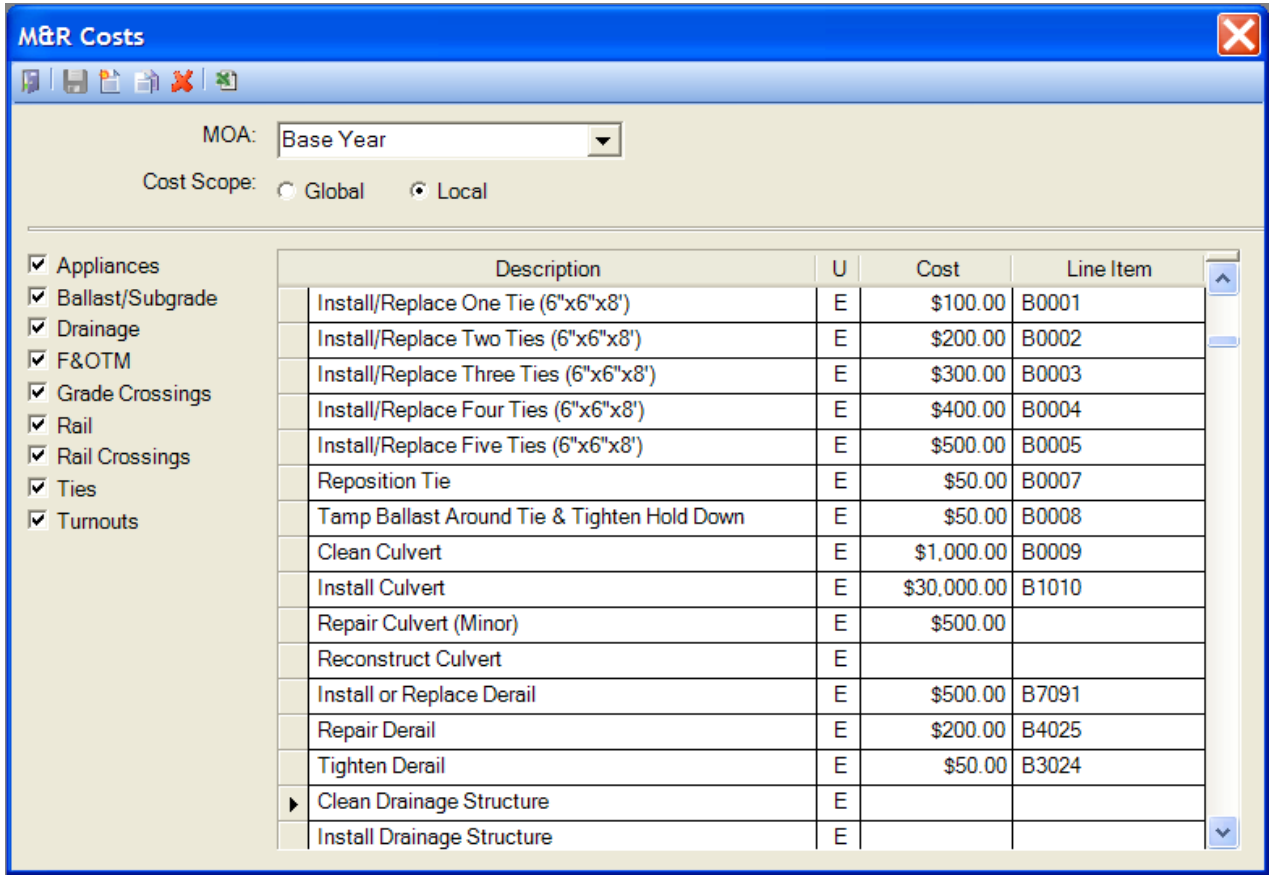
Condition Summary



Work Planning

- Comprehensive library of corrective work actions with user adjusted cost books.
- Multiple policies available to address defects on track
- Tailored scope and work planning horizon
- Prioritize and fund work actions and projects using mission-based criteria
- Actionable work item list automatically generated from inspection results.

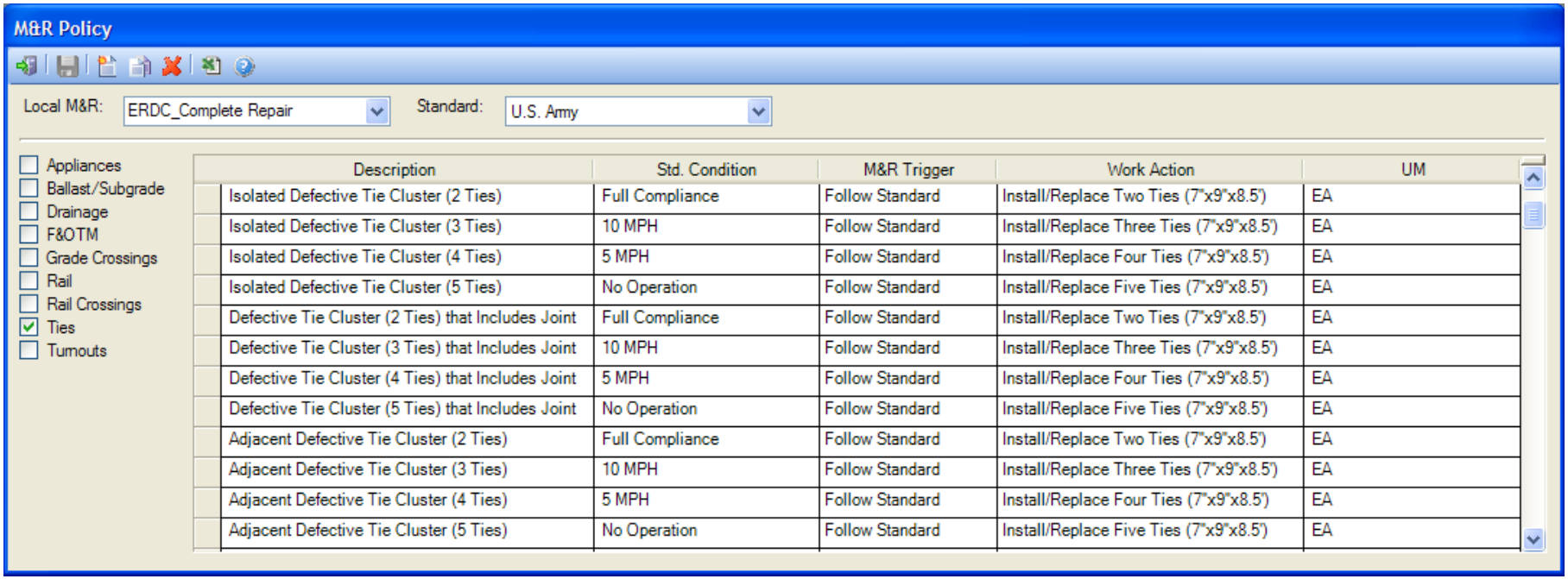
M&R Work Actions and $$$



Description	U	Cost	Line Item
Install/Replace One Tie (6"x6"x8')	E	$100.00	B0001
Install/Replace Two Ties (6"x6"x8')	E	$200.00	B0002
Install/Replace Three Ties (6"x6"x8')	E	$300.00	B0003
Install/Replace Four Ties (6"x6"x8')	E	$400.00	B0004
Install/Replace Five Ties (6"x6"x8')	E	$500.00	B0005
Reposition Tie	E	$50.00	B0007
Tamp Ballast Around Tie & Tighten Hold Down	E	$50.00	B0008
Clean Culvert	E	$1,000.00	B0009
Install Culvert	E	$30,000.00	B1010
Repair Culvert (Minor)	E	$500.00	
Reconstruct Culvert	E		
Install or Replace Derail	E	$500.00	B7091
Repair Derail	E	$200.00	B4025
Tighten Derail	E	$50.00	B3024
Clean Drainage Structure	E		
Install Drainage Structure	E		

A cost book maps each corrective work action to a unit cost and contract line item number

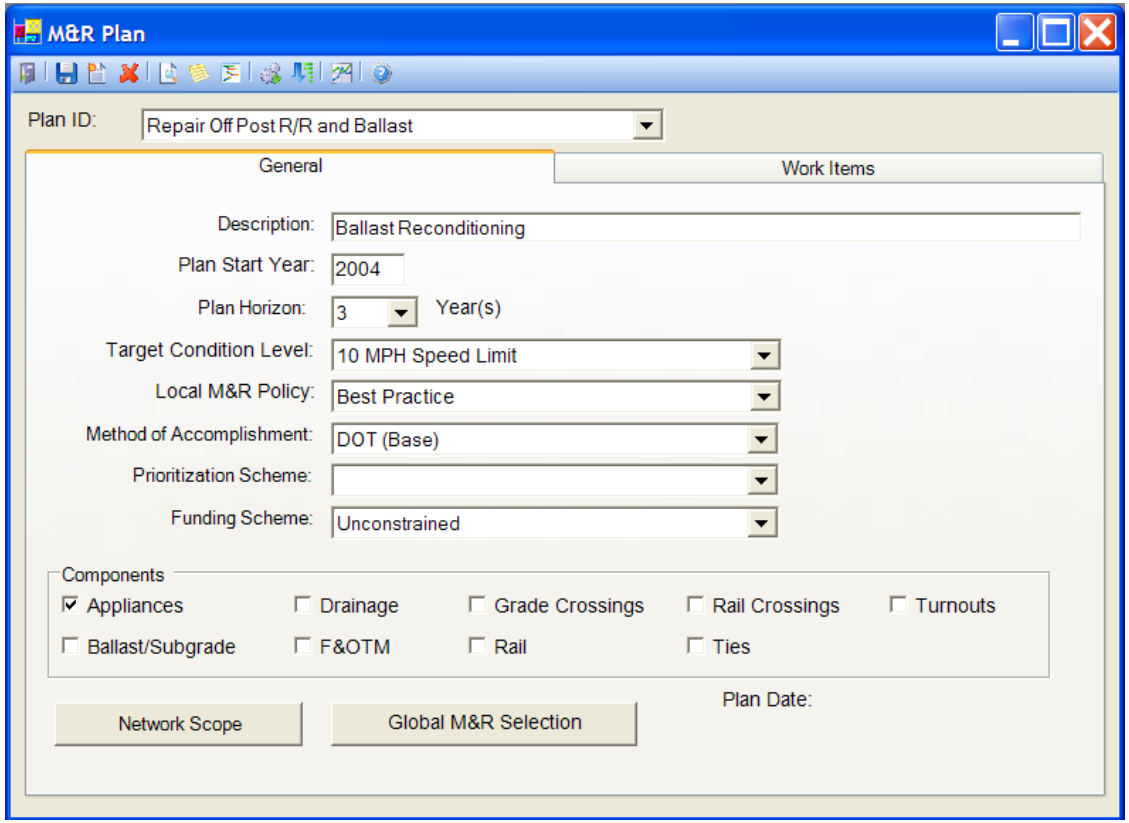
M&R Policies



Description	Std. Condition	M&R Trigger	Work Action	UM
Isolated Defective Tie Cluster (2 Ties)	Full Compliance	Follow Standard	Install/Replace Two Ties (7"x9"x8.5')	EA
Isolated Defective Tie Cluster (3 Ties)	10 MPH	Follow Standard	Install/Replace Three Ties (7"x9"x8.5')	EA
Isolated Defective Tie Cluster (4 Ties)	5 MPH	Follow Standard	Install/Replace Four Ties (7"x9"x8.5')	EA
Isolated Defective Tie Cluster (5 Ties)	No Operation	Follow Standard	Install/Replace Five Ties (7"x9"x8.5')	EA
Defective Tie Cluster (2 Ties) that Includes Joint	Full Compliance	Follow Standard	Install/Replace Two Ties (7"x9"x8.5')	EA
Defective Tie Cluster (3 Ties) that Includes Joint	10 MPH	Follow Standard	Install/Replace Three Ties (7"x9"x8.5')	EA
Defective Tie Cluster (4 Ties) that Includes Joint	5 MPH	Follow Standard	Install/Replace Four Ties (7"x9"x8.5')	EA
Defective Tie Cluster (5 Ties) that Includes Joint	No Operation	Follow Standard	Install/Replace Five Ties (7"x9"x8.5')	EA
Adjacent Defective Tie Cluster (2 Ties)	Full Compliance	Follow Standard	Install/Replace Two Ties (7"x9"x8.5')	EA
Adjacent Defective Tie Cluster (3 Ties)	10 MPH	Follow Standard	Install/Replace Three Ties (7"x9"x8.5')	EA
Adjacent Defective Tie Cluster (4 Ties)	5 MPH	Follow Standard	Install/Replace Four Ties (7"x9"x8.5')	EA
Adjacent Defective Tie Cluster (5 Ties)	No Operation	Follow Standard	Install/Replace Five Ties (7"x9"x8.5')	EA

A policy maps each defect to a corrective work action

Work Plan Scope



Defines:

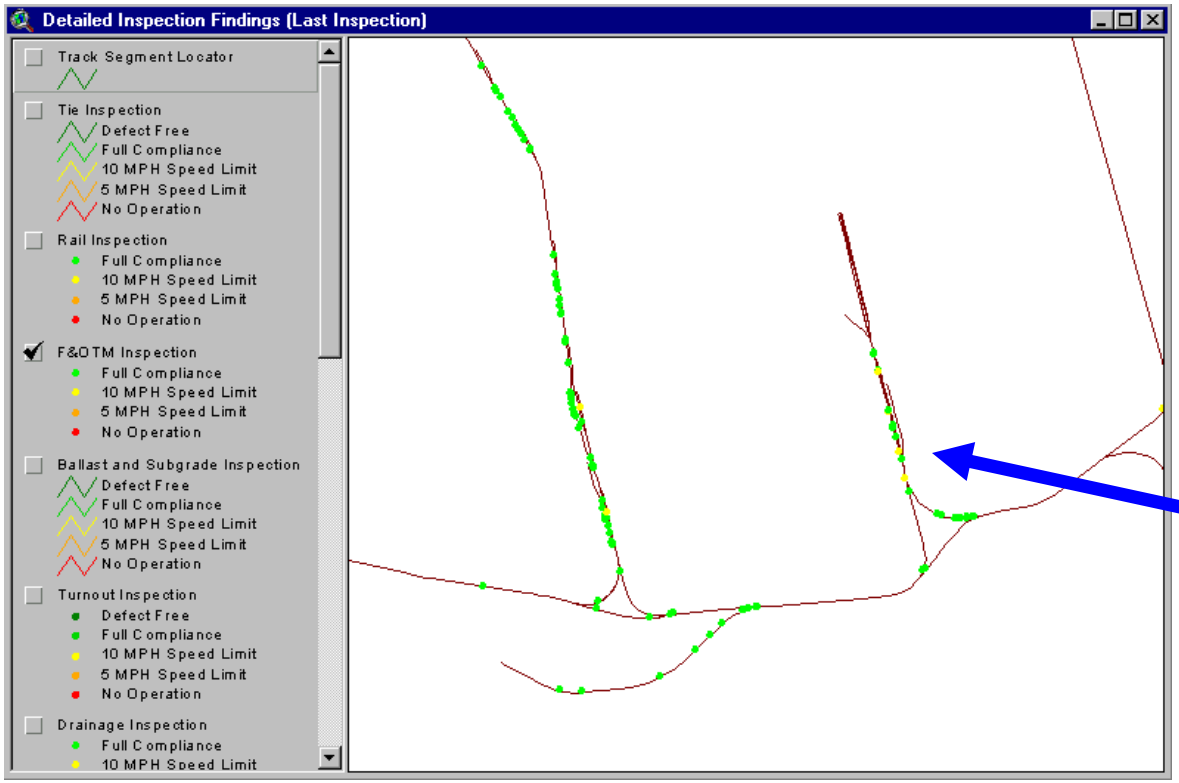
- Plan Horizon
- Target Condition Level
- Policy
- Prioritization Scheme
- Funding Scheme
- Components
- Segments

Work Plan Items

Segment	Component	Begin	End	Cost	ID	Project	WorkYear	Impact	Status
Track 1 (02)	Ballast/Subgrade	5+00	10+00	300			2006		
	Global Work								
	Work Action	Begin	End	Qty.	UM	Unit Cost	Ext. Cost		
	Spray Vegetation	5+00	10+00	500	TF	0.1	50		
	Defects								
	Defect	Begin	End	Rail	Standard	Work Action	Line Item	Quantity	UM
	Alignment	6+00	6+50	N/A	10 MPH	Align Track		50	
Track 1 (02)	OTM	5+00	10+00	807.3			2006		
	Defects								
	Defect	Begin	End	Rail	Standard	Work Action	Line Item	Quantity	UM
	Rail Anchor, Missing	5+00	10+00	B	Full Compliance	Install or Replace Rail Anchor(s)		270	EA
Track 1 (02)	Ties	5+00	10+00	2800.9			2006		
	Defects								
	Defect	Begin	End	Rail	Standard	Work Action	Line Item	Quantity	UM
	Single Defective Tie	5+00	10+00	N/A	Full Compliance	Install/Replace One Tie (7"x9"x8.5')		25	EA
	Single Defective Joint Tie	5+00	10+00	N/A	Full Compliance	Install/Replace One Tie (7"x9"x8.5')		4	EA
	Isolated Defective Tie Cluster (2 Ties)	5+00	10+00	N/A	Full Compliance	Install/Replace Two Ties (7"x9"x8.5')		2	EA
	Isolated Defective Tie Cluster (3 Ties)	5+00	10+00	N/A	10 MPH	Install/Replace Three Ties (7"x9"x8.5')		1	EA
Track 1 (02)	Turnouts	5+00	5+98	185.77	T1A		2006		
	Defects								
	Defect	Begin	End	Rail	Standard	Work Action	Line Item	Quantity	UM
	Switch Stand, Loose	5+00	5+98	N/A	No Operation	Tighten/Respike/Adjust Switch Stand		1	EA
	Guard Rail Filler (Right), Missing	5+00	5+98	N/A	Full Compliance	Install or Replace Guard Rail Filler (Separator Block)		2	EA
Track 1 (02)	Turnouts	9+02	10+00	525.04	T1B		2006		
	Defects								
	Defect	Begin	End	Rail	Standard	Work Action	Line Item	Quantity	UM
	Switch Points (Left), Damaged	9+02	10+00	N/A	10 MPH	Build Up Switch Point and Grind		1	EA

Work Plan list is generated automatically and can be exported to Microsoft® Excel™.

GIS Reporting



- GIS Shows:
  - Track Layout and Attributes
  - Inventory Items
    - Turnouts
    - Grade Crossings
    - etc
  - Defects
  - Track conditions
  - Work Items
  - Work History

Benefits

With one program and a single assessment process, facility managers fulfill the following requirements:

- Asset Inventory
- Annual inspections
- Operational Standards Compliance
- Upward Condition Reporting
- Justifiable Work Plan Creation/Efficient allocation of SRM resources

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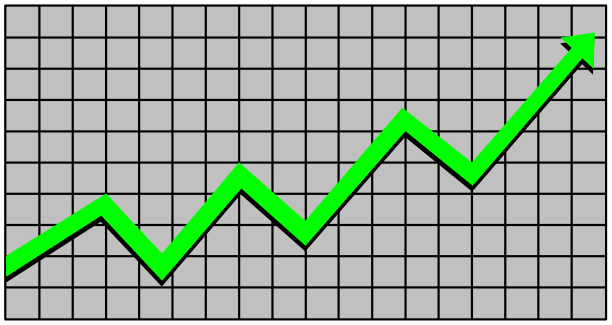
Costs/Productivity



- Implementation productivity rates are network specific.
- RAILER inventory
  - 7-8 miles/day on simple mainline/access track for team of 2
  - 3-4 miles/day in switching/loading yards
  - Varies by # turnouts, track structure changes, etc.
- Detailed Inspections
  - 3-5 miles/day depending on track condition, # turnouts, etc
  - Subsequent re-inspections much higher productivity rates.
- Phasing possible (e.g. main lines first).